

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATIONS:

Specification at page 8, line 8:

the outer periphery end comes in contact with the bend portion at the caulked portion, causing the cap and the filter to be electrically connected to each other.

Specification at page 13, line 5:

the outer periphery end comes in contact with the bend portion at the caulked portion, then the cap and the filter are electrically connected to each other.

Specification at page 14, line 22:

the step of forming the caulked portion comprises a step of electrically connecting the cap and the filter to each other by contacting the outer periphery end at the caulked portion with the bend portion so that the caulked portion includes both states of contact, that is, (i) a strong contact portion and (ii) a weak contact portion, between the surface of the outer periphery end of the flange and the bend portion.

Specification at page 19, line 10:

Fig. 1 (a) shows a sectional view of a top sealing plate for battery in one embodiment of the present invention. Fig. 1 (b) is a partly enlarged view of same. Fig. 2 (a) shows a sectional view of a battery using the top sealing plate. Fig. 2 (b) is a partly enlarged view of same. The top sealing plate 22 includes a cap 11, filter 3, and rubber valve body 12. The filter 3 has an upper opening formed in the top surface thereof and a valve hole 9 formed in the bottom surface thereof. The rubber valve body 12 is used as an example

of the valve body. The valve body 12 is disposed in the top sealing plate 22 so as to close the valve hole 9. The cap 11 is disposed so as to close the upper opening of the filter 3. The cap 11 includes a convex portion 6 formed at the center thereof and a ~~flange portion~~ filter 14 disposed around the convex portion 6. A gas vent hole 10 is formed in the ~~flange portion~~ filter 14. The filter 3 has a dish-shape, and in the center of the filter 3 is formed the valve hole 9. When gas is generated in the battery, the gas is discharged out of the battery through the valve hole 9 and gas vent hole 10. The cap 11 and filter 3 are made of electrically conductive material such as metals. Projection 31 is formed on the surface or back of the outer periphery end of the flange 14 of the cap 11. The projection 31 includes at least one out of a plurality of small projections 16, a plurality of bulges 15, and peripheral edge 17 extending from the outer periphery end which are described later.

Specification at page 25, line 21:

Fig. 5 is a sectional view showing the method of processing top sealing plate 22 shown in Fig. 4. In Fig. 5, the top sealing plate 22 once caulked and set up is supported by the lower die 18 of the press. Wedge-like portion 21 where the tip of the upper die 20 of the press has wedge-like sharpness at several portions is pressed against the caulked portion 13 at the outer periphery of the top sealing plate 22, thereby locally applying pressures thereto. The wedge-like portion 21 of the upper die is used as an example of a protuberant tool. In this way, the wedge-like tip portion 21 bites into the top sealing plate 22, and thereby, the top sealing plate 22 is deformed. Thus, generation of loosening due to springback of the caulked portion can be prevented. Further, it is possible to make perfect the state of contact between the cap 11 and the filter 3.

IN THE CLAIMS:

- 1 1. (Amended) A top sealing plate used for a battery,
- 2 comprising:

3 a filter, a cap, and a valve body,

4 wherein said filter includes a valve hole and upper opening;

5 said cap has a convex portion, and a flange portion disposed
6 around said convex portion;

7 an opening end of said upper opening of said filter has a bend
8 portion;

9 an outer periphery end of said flange portion of said cap and said
10 bend portion include a caulked portion that is caulked and jointed to each
11 other;

12 said caulked portion is formed by caulking while said outer
13 periphery end of said flange is positioned in said bend portion;

14 said valve body is disposed to cover said valve hole, in a space
15 formed between said cap and said filter;

16 said caulked portion includes both contact states of (i) a strong
17 contact portion and (ii) a weak contact portion, between the surface of the outer
18 periphery end of said flange and said bend portion; and

19 said cap and said ~~flange portion~~ filter are electrically connected to
20 each other by the contact with said outer periphery end and said bend portion at
21 said caulked portion.

1 6. (Amended) A top sealing plate used for a battery,
2 comprising:

3 a filter, a cap, and a valve body,

4 wherein said filter includes a valve hole and upper

5 opening;

6 said cap has a convex portion, and a flange portion
7 disposed around said convex portion;

8 an opening end of said upper opening of said filter has a
9 bend portion;

10 an outer periphery end of said flange portion of said cap
11 and said bend portion include a caulked portion that is caulked and
12 jointed to each other;

13 said caulked portion is formed by caulking while said
14 outer periphery end is positioned in said bend portion;

15 said valve body is disposed to cover said valve hole, in a
16 space formed between said cap and said filter;

17 a surface of said outer periphery end of said flange has a
18 projection;

19 said outer periphery end including the plurality of
20 projections and said bend portion are caulked;

21 said strong contact portion is formed with said
22 projection contacted on said bend portion; and

23 said cap and said ~~flange portion~~ filter are electrically
24 connected to each other, by contact between said outer periphery end
25 at the caulked portion and said bend portion.

1 12. (Amended) A top sealing plate used for a battery,
2 comprising:

3 a filter, a cap, and a valve body,

4 wherein said filter includes a valve hole and upper
5 opening;

6 said cap has a convex portion, and a flange portion
7 disposed around said convex portion;

8 an opening end of said upper opening of said filter has a
9 bend portion;

10 an outer periphery end of said flange portion of said cap
11 and said bend portion include a caulked portion that is caulked and
12 jointed to each other;

13 said caulked portion is formed by caulking while said
14 outer periphery end is positioned in said bend portion;

15 said valve body is disposed to cover said valve hole, in a
16 space formed between said cap and said filter;

17 a surface of said outer periphery end of said flange has a
18 projection;

19 said outer periphery end including said projection and
20 said bend portion are caulked;

21 said cap and said ~~flange portion~~ filter are electrically
22 connected to each other, by contact between said outer periphery end
23 at said caulked portion and said bend portion;

24 the distance from a mating face of said filter and cap to
25 the peak of said projection is greater than the thickness of said
26 flange portion; and

27 each of the peaks has a stronger contact pressure against
28 said bend portion of said filter as compared with zones other than
29 said peaks.

1 14. (Amended) A top sealing plate used for a battery,
2 comprising:

3 a filter, a cap, and a valve body,

4 wherein said filter includes a valve hole and upper
5 opening;

6 said cap has a convex portion, and a flange portion
7 disposed around said convex portion;

8 an opening end of said upper opening of said filter has a
9 bend portion;

10 an outer periphery end of said flange portion of said cap
11 and said bend portion include a caulked portion that is caulked and
12 jointed to each other;

13 said caulked portion is formed by caulking while said
14 outer periphery end is positioned in said bend portion;

15 said valve body is disposed to cover said valve hole, in a
16 space formed between said cap and said filter;

17 said cap and said ~~flange portion~~ filter are electrically
18 connected to each other, by contact between said outer periphery end
19 at said caulked portion and said bend portion;

20 said caulked portion includes an integral projection such
21 that said outer periphery end and said bend portion are integrally

22 projected;

23 said integral projection is formed by pressing a
24 protuberant tool from above the bend portion, in a state that said
25 outer periphery end is positioned in said bend portion; and

26 said integral projection has a stronger contact pressure
27 as compared with zones other than said integral projection.

1 16. (Amended) A battery, comprising:

2 a battery case, a positive electrode, a negative electrode,
3 electrolyte, a gasket, and a top sealing plate,

4 wherein said positive electrode, said negative electrode,
5 and said electrolyte are disposed in said battery case;

6 said battery case has an opening;

7 said top sealing plate is disposed at the opening of said
8 battery case, in a state of being electrically insulated by said gasket
9 so as to close said battery case;

10 said filter is electrically connected to said positive
11 electrode;

12 said top sealing plate comprises a filter, cap, and valve
13 body;

14 said filter has a valve hole and upper opening;

15 said cap has a convex portion, and a flange portion
16 disposed around said convex portion;

17 an opening end of said upper opening of said filter has a
18 bend portion;

19 an outer periphery end of said flange portion of said cap
20 and said bend portion include a caulked portion that is caulked and
21 joined to each other;

22 said caulked portion is formed by caulking while said
23 outer periphery end is positioned in said bend portion;

24 said valve body is disposed to cover said valve hole, in a
25 space formed between said cap and said filter;

26 said caulked portion includes both states of contact of (i)
27 a strong contact portion and (ii) a weak contact portion, between the
28 surface of the outer periphery end of said flange and said bend
29 portion; and

30 said cap and said ~~flange portion~~ filter are electrically
31 connected to each other, due to contact established between said
32 outer periphery end and said bend portion at said caulked portion.

1 23. (Amended) A method of manufacturing a battery,
2 comprising the steps of:

3 (a) disposing a positive electrode, a negative electrode,
4 and electrolyte in a battery case;

5 (b) manufacturing a top sealing plate;

6 (c) electrically connecting said filter and said positive
7 electrode; and

8 (d) disposing said top sealing plate at the opening of said

9 battery case via an electrical insulating gasket in order to close the
10 opening,

11 wherein the step of manufacturing said top sealing plate
12 comprises the steps of:

13 (1) forming a filter having a valve hole and upper
14 opening;

15 (2) bending the opening end of the upper opening of said
16 filter, to form a bend portion;

17 (3) forming a cap having a convex portion and a flange
18 portion disposed around said convex portion;

19 (4) caulking to join the outer periphery end to said bend
20 portion while the surface and back of the outer periphery end of said
21 flange portion of said cap are positioned in said bend portion, to
22 form a caulked portion; and

23 (5) disposing a valve body serving to cover the valve
24 hole in a space formed between said cap and said filter, and

25 wherein the step of forming said caulked portion
26 includes a step of electrically connecting said cap and ~~said flange~~
27 ~~portion~~ filter to each other by contacting the outer periphery end at
28 said caulked portion with said bend portion so that said caulked
29 portion includes both states of contact of (i) a strong contact portion
30 and (ii) a weak contact portion, between the surface of the outer
31 periphery end of said flange and said bend portion.